PCAN-Ethernet Gateway DR

CAN to LAN Gateway
in DIN rail plastic casing

User Manual

Document version 1.4.0 (2015-06-01)

Products taken into account

Product Name	Model	Part Number
PCAN-Ethernet Gateway DR	Industry	IPEH-004010

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1 Introduction

The PCAN-Ethernet Gateway DR allows the connection of different CAN busses over IP networks. CAN frames are wrapped in TCP or UDP message packets and then forwarded via the IP network from one device to another.

The PCAN-Ethernet Gateway DR provides one LAN connection and two High-speed CAN interfaces. With its DIN rail casing and the support of the extended temperature range, the module is suitable for use in an industrial environment.

The configuration of the device is done via a comfortable web interface. Besides providing a variety of status information, the website can directly manage settings for the device itself, communication interfaces, and message routing.

1.1 Properties at a Glance

- ARM9 Freescale iMX257 with 16 kByte Level 1 Cache and 128 kByte internal SRAM
- 256 MByte NAND Flash and 64 MByte DDR2 RAM
- Linux operating system (version 2.6.31)
- RS-232 connector for serial data transfer (reserved for future use)
- Connections for CAN, RS-232, and power supply via 4-pole screw-terminal strips (Phoenix)
- Reboot and reset of the device to factory defaults with a reset button
- Configuration of the network interfaces and the message forwarding through a web interface

- Plastic casing (width: 22.5 mm) for mounting on a DIN rail (DIN-EN 60715 TH35)
- LEDs for device status and power supply
- Voltage supply from 8 to 30 V
- Extended operating temperature range from -40 to 85 °C (-40 to 185 °F)

CAN Properties:

- Two High-speed CAN channels (ISO 11898-2)
- Bit rates from 5 kbit/s up to 1 Mbit/s
- Compliant with CAN specifications 2.0A (11-Bit ID) and 2.0B (29-Bit ID)
- Galvanic isolation of the CAN channels up to 500 V against each other, against RS-232 and the power supply
- NXP PCA82C251 CAN transceiver

LAN Properties:

- Data transmission using TCP or UDP
- 10/100 Mbit/s bit rate
- RJ-45 connector with status LEDs

1.2 Prerequisites for Operation

- Voltage supply in the range of 8 to 30 V

1.3 Scope of Supply

- PCAN-Ethernet Gateway DR in DIN rail plastic casing
- Mating connectors (Phoenix, Type: MSTB 2,5/4-ST BK) for both CAN channels, RS-232, and power supply
- RJ-45 network patch cord (2 m)
- Manual in PDF format
- Printed quick start guide

2 Connectors

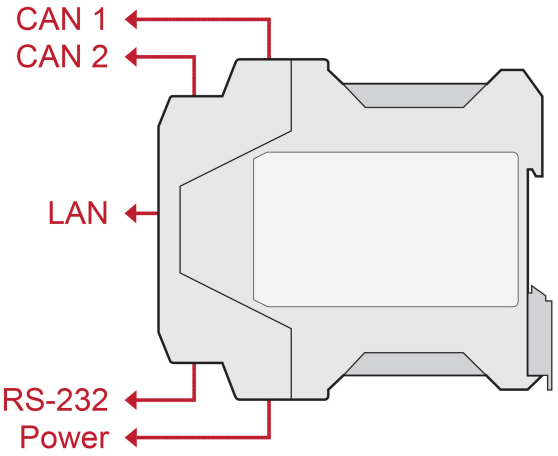

Figure 1: Position of the connectors

2.1 CAN1/CAN2

The CAN connectors are located on the upper side of the casing.

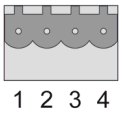

Figure 2: Pin assignment
CAN connector 1 + 2

Pin	Function
1	CAN-High
2	CAN-Low
3	CAN-GND
4	CAN-Shield

2.2 LAN

The RJ-45 connector for connecting to a LAN network is centered on the front of the casing.

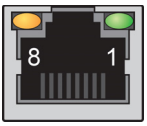

Figure 3: Pin assignment
RJ-45 connector

Pin	Function
1	TxD
2	TxD
3	RxD
4	not connected
5	not connected
6	RxD
7	not connected
8	not connected

2.3 RS-232

The RS-232 connector is located on the lower side of the casing.

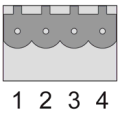

Figure 4: Pin assignment
RS-232 connector

Pin	Function
1	GND
2	RxD
3	not connected
4	TxD

2.4 Power Supply

The connection for the power supply is located on the lower side of the casing.

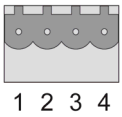

Figure 5: Pin assignment Power connector

Pin	Function
1	GND
2	not connected
3	Vbat (8 - 30 V)
4	Shield (top hat rail potential)

3 Putting into Operation

The PCAN-Ethernet Gateway DR is configured via a web interface. Therefore, the module must be connected via LAN to a computer, located in the same logical network as your gateway (192.168.1.xxx).

3.1 First Connection to the PCAN-Gateway

During initial operation or after resetting to factory defaults, you must pre-configure the PCAN-Gateway for your LAN. The default login data is written on the label on the left side of the PCAN-Gateway. Proceed as described in the following subsections:

3.1.1 Preparing the Computer

- Your computer must be configured with an appropriate IP address to connect to the device via LAN. To determine your IP address and to change it if necessary, follow these steps.

  1. Windows 8.1, 7, Vista: Click on **Start** > **Control Panel** > **Network and Internet** > **Network and Sharing Center**.
     Windows XP: Click on **Start** > **Control Panel** > **Network and Internet** > **Network Connections** (continue with step 3).
  2. On the left side, open the overview of the network adapters via the following link:
     Windows 8.1, 7: **Change adapter settings**
     Windows Vista: **Manage network connections**
  3. Do a right-click on the adapter that will be used for the connection to the PCAN-Gateway and select **Properties**.

     The dialog box **Properties of LAN connection** appears.

4. Windows XP: Select from the list **This connection uses the following items** > **Internet Protocol (TCP/IP)**
   Windows 8.1, 7, Vista: Select from the list **This connection uses the following items** > **Internet Protocol Version 4 (TCP/IPv4)**.

   Click on **Properties** and the dialog box **Internet Protocol Properties** appears.

   Make a note of the current settings in order to reset the computer later on.
5. Select **Use the following IP address**.
6. Enter an **IP address** in the range from 192.168.1.1 to 192.168.1.254 (but not the PCAN-Gateway's own address which is indicated on the left casing side).
7. Click on **Subnet mask**. 255.255.255.0 is shown. Leave this entry unchanged.
8. Confirm the entries with **OK**.

3.1.2 Establishing the Connection

1. Connect the RJ-45 connector of the PCAN-Gateway via a LAN cable (included in the scope of supply) directly to the computer.
2. Connect the device to a suitable power supply (8 - 30 V).
3. Wait until the PCAN-Gateway is ready (Status LED is blinking green).
4. Open a web browser on the computer.
5. In the browser's address bar, enter the address of the PCAN-Gateway (see the label on the left side of the device).

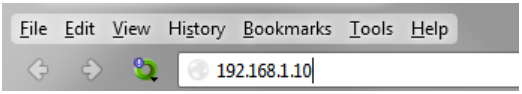

Figure 6: Address bar of the web browser

This opens the configuration website.

6. In the upper right area of the configuration website you can find the login area. Enter “admin“ for each the username and the password and confirm with **Enter**.

   The restricted area appears and you can start setting up the PCAN-Ethernet Gateway DR. You can find a description of the basic configurations in the following section 3.2.

Note: Afterwards reset the computers IP address to the previously noted address.

3.2 Basic Configuration

Change your login data first and then set up the PCAN-Gateway connection to the LAN network.

3.2.1 Change Login Data

1. Open the page **Device** > **User Management**.
2. Change the login data on this page. Create a new username and a new password.

   To ensure a minimum level of security, the password should have at least 8 characters. If possible, use letters, numbers, and special characters.

Important notice: Login data is confidential! Do not act carelessly and leave your system open to attack. Never deposit the login data in any form on the Internet or make it easily accessible. Do not give the new login data carelessly to third parties or send it by e-mail.

3.2.2 Setting up CAN

➡ Enter the following settings to configure the CAN channels:

Open the page **Network** > **CAN**.

1. **Bit rate:** For setting the bit rate, click the drop-down menu and select the value that is used on the connecting CAN bus.
2. **Listen-Only-Mode:** If the PCAN-Gateway should act as a pure observer, not affecting the data traffic, Listen-Only-Mode must be enabled. Activate Listen-Only-Mode with a click on the checkbox.

Confirm the entries with **Save Settings**.

3.2.3 Connecting to a LAN Network

- Accommodate the IP address data of the PCAN-Gateway to the future LAN network.

  Open the page **Network** > **LAN**.

Automatic Address Assignment via DHCP

1. If the future LAN network uses DHCP (Dynamic Host Configuration Protocol), the PCAN-Gateway IP address and Subnet mask are assigned automatically. Enable DHCP to use this feature.
2. Confirm the entry with **Save Settings**.

   You are automatically logged out and the basic setup of the device is now completed. When the PCAN-Gateway is installed in the LAN, it automatically receives its new address data via DHCP.

Note: DHCP is not recommended, because it is necessary to know the IP address of the device to access the configuration website. Furthermore the IP address may change after a restart of the device or the DHCP server. In this case the existing routes won't work.

Manual Address Assignment

1. If the LAN network does not provide DHCP, enter the address data that the PCAN-Gateway should use in the LAN network at the bottom of the page: IP address and Subnet mask. The gateway address can optionally be specified.
2. Confirm the entry with **Save Settings**.

   You are automatically forwarded to the new IP address under which the PCAN-Gateway is now reachable. The basic setup of the device is now completed.

3.3 Installing the Gateway

Do the following to connect the PCAN-Ethernet Gateway DR to an IP network (Ethernet):

1. Mount the PCAN-Ethernet Gateway DR at the appropriate position on the DIN rail by placing it at the top of the rail and snapping it to the bottom.
2. Connect each of the two CAN ports with the affiliated CAN network.

Note: A High-speed CAN bus needs to be electrically terminated on both ends using resistors of 120 Ω. The device does not have an internal termination.

3. Connect the RJ-45 connector using a LAN cable to the IP network.
4. Connect the PCAN-Ethernet Gateway DR to a suitable power supply (8 - 30 V).

The PCAN-Gateway starts automatically. When the status LED is blinking green the device is ready and the current configuration is executed.

Note: In case of a dynamic address assignment via DHCP, the new IP address must first be determined. Commercial routers list all connected devices with their current IP address.

4 Operation

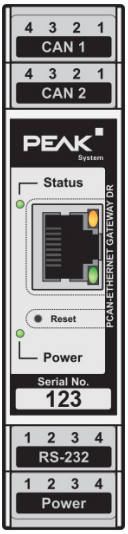

Figure 7: Front side with LEDs and Reset button

4.1 Status LEDs

The PCAN-Ethernet Gateway DR has two status LEDs and two LAN LEDs that represent the following conditions:

LEDs	Status	Condition
Status	Green on	System start
	Green blinking	Ready for operation
LAN	Yellow on	Data is transmitting
	Green on	Connection is established
Power	Green on	Power supply is applied

4.2 Reset Button

If the PCAN-Ethernet Gateway DR is no longer available due to an incorrect configuration, the device can be reset to factory defaults using the Reset button.

To perform a reset, press with a paper clip for example into the small hole on the front side of the casing. Press for 1 second to restart the device. Press for more than 5 seconds to reset the PCAN-Gateway to factory defaults.

With a reset to the factory defaults, the IP address and the login data are reset to the initial value (see the label on the left side of the PCAN-Gateway). Afterwards you can perform a reconfiguration of the PCAN-Gateway (see chapter 3 on page 11).

4.3 Signal Delay

The signal delay between the CAN connection and LAN may vary.

The transmit time of the signal in the IP network depends on the expansion and structure of the network as well as the configuration of the message forwarding. Therefore a fixed value cannot be specified.

5 Configuration

Figure 8: Configuration Website

The configuration of the device is done via a comfortable web interface. Enter the IP address of your PCAN-Gateway into the address bar of your browser.

Afterwards the configuration website opens. Besides providing a variety of status information, the website can directly manage settings for the device itself, communication interfaces, and message routing.

The information that is visible to non logged in users (Public Dashboard) can be set on the page *Device > User Management* (see section 5.6.2 on page 49). The login area can be found to the upper right of the website.

Enter your username and password, then press Enter. After logging in, you will have access to the 7 main areas of the website: Status, Routing, Filters, Network, Device, Help, and Support.

Note: For full functionality and an optimal representation of the website, we recommend one of the following Internet browsers: Internet Explorer 8 or higher, Mozilla Firefox, Safari, Opera, or Chrome.

The storing of cookies by the browser is required to access the website.

Some features of this website require JavaScript. Please enable support for this scripting language if a prompt appears on the website.

5.1 Structure of the Website

5.1.1 Header

The header area of the website displays the product name, as well as a user defined name and description that can be set on the *Device > Configuration* page. This information is used to identify the device.

5.1.2 Navigation

On the left side is the main navigation menu:

- The main pages (Status, Routing, Filters, Network, Device, Help, and Support) display general information
- The subpages of *Network* and *Device* provide configuration options for the device and for the network
- The subpages of *Routing* can be used to add, manage, edit or delete, as well as to search for other devices in the network
- The subpages of *Filters* can be used to add, edit, or delete filters

The links in the control box (below the menu) perform additional website and device functions

- **Refresh:** Clicking Refresh will perform a page reload, for example to update the current route status

Note: The information displayed on the website is not updated automatically by default.

- **Auto Refresh On / Off:** When you activate this function by left clicking the link, the website will begin to automatically update the information on the page every 10 seconds. You can manually turn this function off by left clicking the link again.

Navigating away from the current page will automatically deactivate this function too

- **Status LED On**: The status LED on the device will light up for approximately 10 seconds. This function can be used to identify the device
- **Reboot Device**: Use this link to restart the device. During this process, the PCAN-Gateway will be unreachable for a short time

The red framed Info box at the end of the navigation lists important information about the current configuration.

5.1.3 General Symbols

The configuration website uses a variety of different symbols and icons to convey general information that is valid for many situations.

In some cases, additional information is displayed as a tooltip when you hover the mouse cursor over the icon.

LED Symbol	Meaning
	ON / active
	OFF / inactive
	Warning! The execution / function is prevented. The problem is well known and can be eliminated.
	Attention! An error prevents the execution / function.

5.2 Status

On the *Status* page the current device configuration is displayed.

Device Information:

In this box the product name, the order number, and the serial number of the device are displayed. This information can be used to uniquely identify the device.

- On the *Device* page you will find detailed information about the device

CAN Interfaces:

For each CAN channel the status, bit rate, and the setting of the Listen-Only-Mode are displayed.

- The CAN interfaces can be configured on the *Network > CAN* page.

LAN Interface:

This box displays the LAN interface settings. IP address, Subnet mask, and gateway are adjustable. The MAC address cannot be changed. Each device receives a unique MAC address during the manufacturing process, which can be used for identification.

- The LAN interface can be configured on the *Network > LAN* page

Defined Routes:

Here, each message forwarding is displayed with its basic information. For each of these, the index, the status, the used transmission protocol, the source and destination, as well as the used filters are specified.

- On the *Routing > Manage Routes* page, the routes can be managed, edited, and deleted
- On the *Routing > Add Route* page new message forwarding instances can be created

Defined Filters:

This box contains an overview of all defined filters with basic information. Starting with the index, every filter is displayed with its usage, name, type, and mode.

- On the *Filter > Manage Filters* page, the filters can be managed, edited, and deleted
- On the *Filter > Add Filter* page new filters can be created

5.3 Routing

Routing displays basic information about the created routes and PCAN-Gateways detected on the network.

Defined Routes:

Here, each message forwarding is displayed with its basic information. For each of these, the index, the status, the used transmission protocol, the source and destination, as well as the used filters are specified.

- On the *Routing > Manage Routes* page, the routes can be managed, edited, and deleted
- On the *Routing > Add Route* page new message forwarding instances can be created

Detected Devices:

This table shows all PEAK-System gateways that were detected during the last network broadcast scan. If no other devices are currently in the network or no scan has been performed, this table will not be shown.

Each PCAN-Gateway is displayed with its product name, the custom device name, MAC address, and serial number. This information can be used to identify the device. In addition, the IP address and a small icon of the device are displayed. With a left-click the configuration website of this device can be opened in a new tab.

- On the *Routing > Scan for Devices* page, a search for available devices on the network can be performed

Note: When changing the network topology, the list is not updated automatically. If a device is removed from the network, it will remain visible in the list of detected devices until the scan is performed again and the list is updated.

5.3.1 Manage Routes

On the page *Routing > Manage Routes* the message forwarding instances are listed with basic information and control options. For each of these, the index, the status, the used transmission protocol, the source and destination, as well as the used filters are specified.

Index: For saving routes, the PCAN-Gateway uses a table with 8 rows that are addressed with the unique index.

Filter: Hover the filter icon with the mouse cursor to display a list of the attached filters. The list refers to the indices of the filters. Perform a left-click on the icon to open the page *Filters > Manage Filters* with the corresponding rows highlighted.

Status: The LED indicates the status of a route.

LED Symbol	Meaning
	The route is inactive.
	The route is active and connected with the remote site.
	Warning! The route is active but not connected with the remote site.
	PCAN-Gateway handshake is inactive.

Source / Destination: The source and the destination depend on the direction of the message forwarding.

In a Receive route the PCAN-Gateway receives data via the IP interface and forwards it to a CAN channel. The IP address is displayed in this case as "Local IP".

In a Send route the data of a CAN channel is forwarded over the IP interface. By left-clicking the IP address of the receiver, its configuration website can be opened.

Protocol: Routes can use TCP or UDP as the transmission protocol in the IP network.

TCP (Transmission Control Protocol) establishes a connection between two participants and monitors their communication. If data packets are lost for example, they are retransmitted.

UDP (User Datagram Protocol) sends the data packets directly into the network without establishing a connection. With this protocol, error free transmission is not guaranteed. The advantage UDP has over TCP is the lower demand on performance.

Control Elements:

Symbol	Meaning
	Switch ON / Switch OFF (depending on the current state)
	Delete
	Edit

ON/OFF: Use the "ON / OFF" switch to activate or deactivate a route.

Delete: Click on the trash can icon to remove the route.

Edit: Click on the pencil icon to edit the route. The route is loaded into the forms of the page *Routing > Add Route*. The same input and configuration options are available there. Detailed information can be found in the following chapter 5.3.2.

Add Route : This button opens the *Routing > Add Route* page on which you can set up a new message forwarding instance.

Additional information:

Each route is provided with additional information about its connection and data transfer status. This additional information can be viewed by clicking on the triangle icon located on the right edge of the route.

In Expert mode (see chapter 5.6.2 *Device> User Management*) detailed connection status information are displayed. With the Reset button you can reset the values of the route to 0.

5.3.2 Add / Edit Route

On the *Routing > Add Route* page you can set up a new route. Similarly, an existing route can be edited via the form displayed. For this, the current settings are loaded into the form fields. Editing a route is done via the page *Routing > Manage Routes*.

For saving routes, the PCAN-Gateway uses a table with 8 rows that are addressed with a unique index. If a new route to be set up, the lowest free index will be assigned. Because of that, only up to 8 routes can be created regardless of the status. Then the *Add Route* function is no longer available.

Route Direction:

When you create a route, you should start with the selection of direction since the following input and output fields are determined by this.

Receive IP > CAN: In a Receive route the PCAN-Gateway receives data via the IP interface and forwards it to a CAN channel. The IP address shown in this case is "Local IP". The configuration of the local IP interface is done on the *Network > LAN* page.

Send CAN > IP: In a Send route the data of a CAN channel is forwarded over the IP interface. If other PCAN-Gateways were discovered during a broadcast scan, they can be selected for the destination of the route. On the page *Routing > Scan for Devices* you can search for other PCAN-Gateways in the network.

Status:

Use this setting to determine the state of the route after it is created. Ticking the checkbox will have the effect of immediately activating the route after the completed form is saved.

PCAN-Gateway handshake off: (Expert mode only) If this checkbox is active, no handshake will be performed and therefore no status information will be gathered for this route. Use this option for communication with your own application*.

CAN Interface:

Choose one of the available CAN channels. The configuration of the CAN interfaces is done on the page *Network > CAN*.

IP Interface:

IP-Address Source: This field only appears when PCAN-Gateways were detected during a network broadcast scan and the direction “Send CAN> IP" is selected.

Select the desired device from this drop-down menu. The following IP address is automatically set to the appropriate value. If you prefer to enter the IP address yourself, select "Manual Input".

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* For information about the data protocol see the PCAN-Gateway developer documentation.

IP Address: Enter the IP address (IPv4) of the destination device. It should be noted that only values from 0 to 255 may be used and certain address ranges are reserved.

- In the first field, enter a value less than 224, since addresses starting from this value are reserved for Multicast messages
- Depending on the Subnet mask, the highest device address is reserved for broadcast messages. For the Subnet mask 255.255.255.0 and the network address 192.168.1.xxx, the reserved address would be: 192.168.1.255
- Depending on the Subnet mask the lowest device address is reserved for messages that are addressed to the entire network. For the Subnet mask 255.255.255.0 and the network address 192.168.1.xxx, the reserved address would be: 192.168.1.0

Port: Enter a port between 1024 and 65535. Values below 1024 are reserved for various system services and must therefore not be used.

Protocol: Select which transmission protocol should be used by the route in the IP network.

TCP (Transmission Control Protocol) establishes a connection between two participants and monitors their communication. If data packets are lost for example, they are retransmitted.

UDP (User Datagram Protocol) sends the data packets directly into the network without establishing a connection. With this protocol, error free transmission is not guaranteed. The advantage UDP has over TCP is the lower demand on performance.

Note: Any combination of the IP address, port, and protocol can only be used once.

Frames per Packet: This value specifies how many CAN frames are transmitted per IP packet. The higher the value, the greater the delay in the transmission of CAN messages. However, the demand on performance is lower in this case. This selection is only available for Send routes when using the UDP protocol.

Finally you can create a new route with the Add Route button or save the changes after editing with the Save Settings button.

Note: Transferring data between 2 PCAN-Gateways always consists of a Send and a Receive route. Note that both should use the same transmission protocol (TCP or UDP) and the same port.

Filter:

The defined filters are listed in this formula. A single one can be attached or detached to Send routes via the radio buttons. If Expert mode is active, the radio buttons will be replaced with checkboxes and multiple filters can be selected.

Filters are joined with: This property specifies how multiple filters are linked. If you use several Whitelist filter, you should choose Logical OR. If you attach multiple Blacklist filter to a single route, the selection Logical AND is recommended.

Note: A single *Range* filter is realized with a composition of multiple *Mask* filters. The Joined Filters property will also affect this.

5.3.3 Scan for Devices

Using the *Routing > Scan for Devices* page a broadcast message can be sent to the IP network, to which all PCAN-Gateway products report. From the obtained information, a list of available devices is created. The detected devices can then be used as target destinations while creating or editing routes.

Note: When changing the network topology, the list is not updated automatically. If a device is removed from the network, it will remain visible in the list of detected devices until the scan is performed again and the list is updated.

Detected Devices:

This table shows all PEAK-System gateways that were detected during the last network broadcast scan. If no other devices are currently in the network or no scan has been performed, this table will not be shown.

Each PCAN-Gateway is displayed with its product name, the custom device name, MAC address, and serial number. This information can be used to identify the device. In addition, the IP address and a small icon of the device are displayed. With a left-click the configuration website of this device can be opened in a new tab.

Perform Scan: By clicking on the Perform Scan button, the list of available devices is updated. The scan takes a short time. Please wait until you are forwarded.

5.4 Filters

Filters are used to filter CAN messages by their ID. It is possible to create up to 32 of them. Each filter can be attached to multiple Send routes via the page *Add Route* or *Edit Route*.

The page *Filters* displays basic information about the created filters.

Defind Filters:

This box contains an overview of all defined filters with basic information. Starting with the index, every filter is displayed with its usage, name, type, and mode.

- On the *Filters > Manage Filters* page, the filters can be managed, edited, and deleted
- On the *Filters > Add Filter* page new filters can be created

5.4.1 Manage Filters

On the page *Filters > Manage Filters* the existing filters are listed with basic information and control options. Each of them is specified with its index, usage, name, type, and mode.

- **Index**: For saving filters, the PCAN-Gateway uses a table with 32 rows that are addressed with this unique index.
- **Usage**: The badge on the left shows how many times the filter is used. The information to which routes it is attached to, is displayed as a tooltip when hovering with the mouse cursor. The list refers to the indices of the routes. If you click on the badge, the page *Manage Routes* will be opened with the corresponding routes highlighted.

- **Name**: While creation a name can be assign to a filter. It can be used for identification while managing the filters or attaching them to routes.
- **Type**: This column displays the filter type (Range or Mask) and the used CAN ID mode (11- or 29 Bit). Detailed information can be found in chapter *5.4.2 Add / Edit Filter*.
- **Mode**: The filter mode (Blacklist or Whitelist) indicates if the defined filter is inverted or not.

Control Elements:

Symbol	Meaning
	Delete: Click the trash icon to remove the filter. If it is attached to one or more routes, it will be automatically detached
	Edit: Click on the pencil icon to edit the filter. The filter is loaded into the forms of the page *Filters > Add Filter*. The same input and configuration options are available there. Detailed information can be found in chapter *5.4.2 Add / Edit Filter*

Add Filter: The button below the information table opens the *Filters > Add Filter* page on which you can set up a new filter. It is not available if the limit of 32 filters is reached.

Detailed Information:

The filters are provided with detailed information. It can be displayed by clicking on the triangle icon located on the right edge of each filter row.

5.4.2 Add / Edit Filter

On this page you can set up a new filter. Similarly, an existing one can be edited via the form displayed. For this, the current settings are loaded into the form fields. Editing a filter is done via the page *Filters > Manage Filters*.

For saving filters, the PCAN-Gateway uses a table with 32 rows that are addressed with a unique index. If a new filter to be set up, the lowest free index will be assigned. Because of that, only up to 32 filters can be created regardless of their status. If the limit is reached, the *Add Filter* function is no longer available.

Type and ID Mode:

When you create a filter, you should start with the selection of the type and ID mode since the following input and output fields are determined by this. The filter types *Range* and *Mask* specify how the CAN IDs to be filtered are defined.

The ID modes specify if the CAN message will be a Standard frame with an 11 Bit identifier or an Extended frame with a 29 Bit identifier. This changes the ID value range that can be entered in the following forms.

Mode:

The mode indicates how the defined filter is interpreted.

- **Whitelist**: A filter using this mode will transmit every CAN message whose ID matches the filter specifications.
- **Blacklist**: If this mode is selected, the filter will be inverted. That means every message with a CAN ID that matches the filter specifications will not be transmitted.

Type Range:

If the filter type *Range* was chosen, a lower and an upper limit have to be specified to set the range. This can be done via the slider (JavaScript support required) or with the input forms.

From: This value marks the lower limit of the filter range.

To: This value marks the upper limit of the filter range.

While entering the values the following should be considered:

- The values are entered in hexadecimal format. Invalid input will be ignored
- The *From* value has to be lower than the *To* value

Type Mask:

The working principle of this acceptance filtering is based on the SJA1000 CAN controller. Detailed information can be found in the NXP Application Note *AN97076 - SJA1000 Stand-alone CAN controller* chapter 4.1.2.

The ID of the CAN message to be transmitted is compared bitwise with the *Acceptance Code* value. The *Acceptance Mask* specifies which bit positions are relevant.

- 0 = relevant. The CAN ID at the corresponding bit position has to match the value of the Acceptance Code.
- 1 = not relevant. The CAN ID at the corresponding bit position does not matter.

In contrast to the original implementation, the PCAN-Gateway *Mask* filter only looks at the CAN ID. It cannot process any data bytes or the RTR flag.

The size of the *Acceptance Mask* and *Acceptance Code* depends on the ID mode selection above and can be 11 Bit for Standard with a range of 0 to 7FF or 29 Bit for Extended with a range of 0 to 1FFFFFFF.

Example for 11 Bit identifiers:

IDs											Meaning
0	1	1	1	1	0	1	1	1	1	1	Acceptance-Code
1	1	1	0	0	0	0	1	1	0	1	Acceptance-Mask
X	X	X	**1**	**1**	**0**	**1**	X	X	**1**	X	CAN messages with an ID matching this binary value, are accepted. X means that this bit position does not matter.
MSB									LSB		

Name:

A name with up to 50 characters can be assign to a filter. It can be used for identification while managing filters or attaching them to routes.

Description:

You can enter additional information with a length of 200 characters for each filter. This text is only available on the page *Filters > Add / Edit Filter* and *Filters > Manage Filters*.

Finally you can create the new filter with the Add Filter button or save the changes after editing with the Save Settings button.

5.5 Network

The *Network* page provides information about the current configuration of available communication interfaces.

CAN Interfaces:

For each CAN channel the status, the bit rate, and the setting of the Listen-Only-Mode are displayed.

- The CAN interfaces can be configured on the *Network > CAN* page. In addition, this page provides detailed information about the interfaces

LAN Interfaces:

This box displays the LAN interface settings. IP address, Subnet mask, and gateway are adjustable. The MAC address cannot be changed. Each device receives a unique MAC address during the manufacturing process, which can be used for identification.

- The LAN interface can be configured on the *Network > LAN* page

5.5.1 CAN

The *Network > CAN* page displays the current settings of the CAN interfaces as well as options to configure them. Information about the status, Listen-Only-Mode, and the bit rate is displayed for each CAN channel.

Channel: The channel number of the CAN interface. This number is used to select the intended interface while creating a route.

Status: The LED indicates the state of the CAN channel.

LED Symbol	Status	Meaning
	Active	The channel is active and functional.
	Inactive	The channel is inactive.
	Error Active	Errors were detected on the BUS. The CAN controller's error count is lower than 128. (BUSLIGHT)
	Error Passive	Errors were detected on the BUS. The CAN controller's error count is greater than 127. (BUSHEAVY)
	Bus Off	Errors were detected on the BUS. The CAN controller's error count is greater than 255. The CAN controller has been switched off. (BUSHEAVY)

Bit Rate: CAN channel transmission rate. This value should match that one of the connected CAN bus.

Listen-Only-Mode: The state of the Listen-Only-Mode is represented by an LED.

LED Symbol	Meaning
	Active. The CAN channel is not sending messages, nor is it answering incoming messages (Acknowledge).
	Inactive

Additional Information: Furthermore status information and user defined notes are available for each channel. Click the triangle icon on the right edge of the list item to view the information. With the Reset button you can reset the CAN channel.

In Expert mode, (See chapter 5.6.2 *Device > User Management*) further detailed information is displayed.

CAN Channel Configuration:

Each channel is handled and configured by a separate form. Settings can be saved by clicking the Save Settings button located underneath the form.

Activate / Deactivate: (Expert mode only) Use the Checkbox to activate or deactivate the CAN channel.

Bit Rate Selection: For setting the bit rate, click the drop-down menu and select the value that is used on the connected CAN bus.

Custom Bit Rate: (Expert mode only) By clicking on this checkbox, a form for configuring a custom transmission rate can be opened. For details, see the following section *Configuring Custom Bit Rates*.

Listen-Only-Mode: If the PCAN-Gateway should act as a pure observer, not affecting the data traffic, Listen-Only-Mode must be enabled. Activate Listen-Only-Mode with a click on the checkbox.

User Notes: Each CAN channel can have a comment. The maximum length of the comment is 125 characters.

Configuring Custom Bit Rates

In Expert mode, you can create a custom bit rate and configure the sample point. Via the *Custom Bit Rate* checkbox, the necessary input fields for entering the register values of the CAN controller are displayed.

The first four fields have a direct impact on the bit rate and the sample point.

Bit Rate Prescaler: With this input field, the radio of CPI clock and serial clock frequency is set. It accepts values from 1 to 256.

Phase Segment 1 & 2: The phase segments are used to compensate edge phase errors at the beginning and end of the bit. Phase Segment 1 expects an input from 1 to 8 and Phase Segment 2 accepts values from 2 to 8.

Propagation Segment: This time segment is used to compensate the signal delays over the network and can accept values from 1 to 8.

Calculated bit rate: The form checks your entries and calculates the transmission rate using the following formula:

$$\text{Bit Rate} = \frac{24\ \text{MHz} / \text{Bit Rate Prescaler}}{\text{Sync Seg.} + \text{Time Seg.1} + \text{Time Seg.2}}$$

The segment Synchronization is always 1 and is used for the synchronization of each bus node. The sampling time (sample point) is determined via Time Segments 1 and 2. Time Segment 1 consists of Phase Segment 1 and the Propagation Segment. Their

sum must be at least 4. Time Segment 2 is defined by Phase Segment 2.

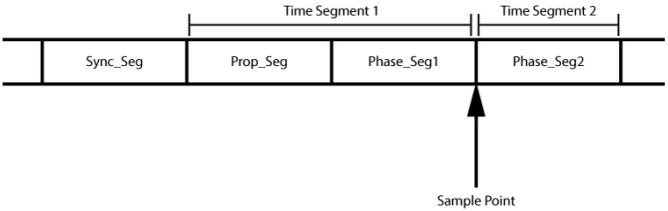


Figure 9: Bit Timing

Note: When entering values the resulting transmission rate is automatically calculated in real time. If the values are incorrect, or the calculated bit rate is beyond the limits of the CAN transceiver (5 kbit/s to 1 Mbit/s), the data can not be saved.

Re-Synch. Jump Width (1 – 4): The Resynchronization Jump Width defines the maximum extension or shortening of the Phase Segments for the signal resynchronization. This value is not used for the calculation of the bit rate. It accepts values from 1 to 4.

By clicking on the Save Settings button you can save your previously defined bit rate.

5.5.2 LAN

The *Network > LAN* page displays the current settings of the LAN interface and provides options for configuration.

LAN Interface

In this box the settings of the LAN interface will be displayed. IP address, Subnet mask, and gateway are adjustable. The MAC address cannot be changed. Each device receives a unique MAC address during the manufacturing process, which can be used for identification.

LAN Address Settings

The LAN interface can be configured by using the form underneath the general information overview. Settings can be saved by clicking the Save Settings button located below the form.

DHCP: If the IP network uses DHCP (Dynamic Host Configuration Protocol), the PCAN-Gateway IP address, Subnet mask, and gateway address are assigned automatically. Otherwise, you must manually enter the information. Switch DHCP on if required (Enable).

Note: DHCP is not recommended, because it is necessary to know the IP address of the PCAN-Gateway to access the configuration website. Furthermore the IP address may change after a restart of the device or the DHCP server. In this case the existing routes won't work.

IP Address: Enter the IP address (IPv4) of the LAN interface. It should be noted that only values from 0 to 255 may be used and certain address ranges are reserved.

- In the first field, enter a value less than 224, since addresses starting from this value are reserved for Multicast messages
- Depending on the Subnet mask, the highest device address is reserved for broadcast messages. For the Subnet mask

255.255.255.0 and the network address 192.168.1.xxx, the reserved address would be: 192.168.1.255

- Depending on the Subnet mask the lowest device address is reserved for messages that are addressed to the entire network. For the Subnet mask 255.255.255.0 and the network address 192.168.1.xxx, the reserved address would be: 192.168.1.0

Subnet mask: The Subnet mask indicates which part of the IP address represents the network, and which part represents the device. This subdivision is achieved by filling in the (binary) Subnet mask from left to right with the number “1”. The resulting values for the individual fields are: 0, 128, 192, 224, 240, 248, 252, 254 and 255.

While entering values from left to right, as soon as a value smaller than “255” is entered, a “0” must follow. For example 255.255.128.0 is valid, while 255.128.255.0 is false.

Gateway: Enter the IP address (IPv4) of the gateway that manages the IP network. Proceed with the same guidelines as outlined for local IP address entry. Entering a gateway address is optional.

Note: Please note that after modifying these settings, the device may not be reachable. Possible causes for this are:

- You have activated DHCP. The IP address of the device is not known, because it has been acquired dynamically from the gateway. The address can often be found on a list provided by the gateway.
- You have changed the part of the address assigned to the network (see Subnet mask information). In this case the device is now part of a different network than the one your computer is a part of. Connecting to the device is only possible by respectively adapting your computer’s IP address to the different network that the device is in.

5.6 Device

The *Device* page displays detailed information about your PCAN-Gateway.

General Product Information: In this area, the product name, order number, and the serial number of the device are displayed. This information can be used to uniquely identify the device.

User defined Device Information: The information displayed here can be defined by the user on the *Device > Configuration* page. This information can be used to uniquely identify the device.

Interface Information: This area lists all available communication interfaces regardless of their state.

Version Information: This area shows different information concerning versions:

- Hardware Version: The hardware version indicates the revision of the circuit board
- Software Version: This version number indicates the version of the installed software package. This, additionally to the software, includes the firmware and the website. The software package can be updated on the page *Device > Software Update*
- Website version: This number indicates the version of the configuration website that you are currently using. The website is updated automatically when a software update is processed

5.6.1 Device Configuration

On the *Device > Configuration* page it is possible to assign a custom name and description to the device. In addition to that, different import and export options are available.

Custom Device Name and Description:

Use this form to assign a name and description to the PCAN-Gateway. This will aid in identifying the device among other similar devices. The name and description will be shown in the header of the website and other areas.

Name: Enter a name for the device in this field. The maximum length allowed is 50 characters. Please note: This name is separate from the product name that is also displayed in the header area of the website.

Depending on the IP network, it is possible to access the website of the device by typing this name with a previous **http://** in the address bar of the browser.

Description: Enter a description for the device in this field. The maximum length allowed is 200 characters.

The entries can be saved by clicking the Save Settings button located beneath the form.

Import Configuration:

This form allows the importing of locally saved configuration files. After an import, all communication interfaces and device settings, as well as the routes and filters are restored. The current configuration is overwritten within that process.

Use the button on the left side to select a configuration file (*. ini). To start the restoration process, click the Import button located on the right.

Note: If you import a configuration file from another PCAN-Gateway device that is in the same network, its IP address will also be imported and loaded. Both devices would then have the same IP address. This would cause an address conflict and would result in both devices being non accessible.
In such a case, separate one device from the power supply. The other device will then become accessible again and its IP address can be changed manually. This will resolve the address conflict and both devices can be used again.

Export Configuration:

With the Export button an ini file can be downloaded containing all device configurations as well as all route and filter settings.

The file can be freely renamed, the contents of the file however should not be altered. Importing altered configuration files can lead to failures during the import process. Only valid configuration files can be used for device restoration.

Reload Default Settings:

With the Reload button you can restore the device to its factory defaults. During this process the login settings, all device and communication interface settings along with existing routes will be restored to the states they were in at the time of product delivery. The current configuration is overwritten within that process. In addition, the access data will be reset to the default values (see the label on the left side of the device). The PCAN-Gateway is then reachable under the default IP address (192.168.1.10).

5.6.2 User Management

The *Device > User Management* page provides options for entering new login credentials, changing and defining the display mode, and determining what information should be visible on the login page.

Login Settings:

Enter your current login details in the upper part of the form. In the lower part you can enter a new username and a new password. The new password must be confirmed in order to exclude accidental input.

To ensure a minimum level of security, the password should have at least 8 characters. If possible, use letters, numbers, and special characters.

Save your inputs with the Save Settings button.

Important notice: **Login data is confidential!** Do not act carelessly and leave your system open to attack. Never deposit the login data in any form on the Internet or make it easily accessible. Do not give the new login data carelessly to third parties or send it by e-mail.

Display Mode Setting:

This form provides the opportunity to change the display mode. Expert mode enables access to more detailed information and professional settings. Interpreting this information and using these features requires advanced knowledge of TCP/IP, CAN, and the message forwarding of the PCAN-Gateways. This setting is valid only for the current session and will be reset with your next login.

Click on the drop-down menu and choose one of the two modes. Save this setting by clicking the Save Settings button.

Public Dashboard:

This form is responsible for defining what information is visible on the website to non-logged in users. Only basic status information can be made visible, configuration options cannot be unlocked publicly.

Activate or deactivate the checkboxes to toggle the visibility of their corresponding information. Confirm your choices with the Save Settings button.

5.6.3 Software Update

Initiating a software update will update the firmware, software, as well as the configuration website. The currently installed software package version is indicated by the software version number. This number can be found on this page *Device > Software Update* itself as well as on the *Device* page.

Current product updates can be downloaded on the PEAK-System website (www.peak-system.com). Please make sure to download the correct package for your device. Every version of the PCAN-Gateway product family has a separate download package.

It's recommended to backup the current configuration before performing a software update or downgrade. The current settings may get lost if they are not supported by the software package to be installed or if a failure like a power cut happens.

Perform a software update:

1. Use the button on the left to choose the software package (*.tar).
2. Start the process with the Start Software Update button. Please note: In order to prevent conflicts all CAN interfaces as well as all created routes will be put on standby.
3. After the software update has completed the device will reboot. You will be forwarded to the login page in which case the process was successful and all routes and CAN interfaces have been reactivated.

Note: If the update process was interrupted, you will have to restart the device in order to reactivate the routes and CAN channels. Use the **Reboot Device** link located near the bottom of the main navigation. Alternatively you can use the physical **Reset button** located on the device itself.

Note: Export your current configuration, if you like to downgrade to an older software package. The current settings, routes, and filters may get lost.

5.7 Help

The *Help* page contains the complete help information available for your Gateway's Configuration web site. It is nearly identical to chapter 5 of the PDF documentation.

Question mark icons are located next to every page title, clicking on one will open a corresponding help page.

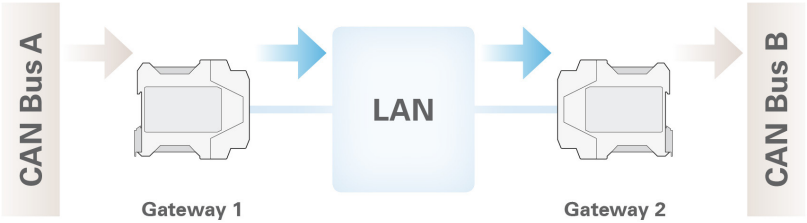
5.8 Support

On the *Support* page you will find links to product documentation (German and English) as well as contact information of PEAK-System Technik GmbH.

6 Application Examples

The PCAN-Ethernet Gateway DR allows the connection of different CAN busses over IP networks. CAN frames are wrapped in TCP or UDP message packets and then forwarded via the IP network from one device to the other. This makes it possible for CAN networks to connect to each other over large distances.

6.1 Unidirectional Data Transmission



For unidirectional data transmission the message traffic from CAN bus A is to be forwarded to CAN bus B via a LAN network. Necessary for this are two PCAN-Ethernet Gateways DR and the creation of a route on each device.

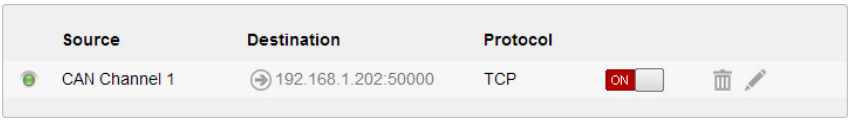
In this example Gateway 1's IP address is 192.168.1.201 and it is connected to CAN bus A via CAN channel 1. Gateway 2's IP address is 192.168.1.202 and it is connected to CAN bus B via CAN channel 2.

Creating a Send Route:

Incoming messages from Gateway 1 are to be transferred into the LAN network. For this, a Send route with the following values must be created.

Gateway 1 > Send Route		
Route Direction	Send: CAN > IP	
Status	Activate	
CAN	Channel 1 (connected to CAN bus A)	
IP Interface	IP-Address	192.168.1.202 (address of Gateway 2)
	Port	50000
	Protocol	TCP

After saving, the route on Gateway 1 will be displayed on the *Routing > Manage Routes* page as follows.



Creating a Receive Route

Gateway 2 is to accept the data packets sent via LAN network by Gateway 1, and pass the containing CAN messages through CAN channel 2 into CAN bus B. For this, a Receive route with the following values must be created.

Gateway 2 > Receive Route		
Route Direction	Receive: IP > CAN	
Status	Activate	
IP Interface	Port	50000 (like the Send route)
	Protocol	TCP (like the Send route)
CAN	Channel 2 (connected to CAN bus B)	

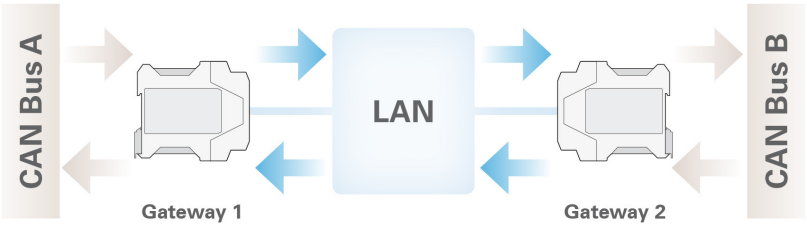
Transferring data between 2 PCAN-Gateways always consists of a Send and a Receive route. Note that both should use the same transfer protocol (TCP or UDP) and the same port.

After saving, the route on Gateway 2 will be displayed on the *Routing > Manage Routes* page as follows.

A short time after both routes have been created and activated, the connection will establish. You can interrupt the connection by deactivating or erasing one of the routes on the *Routing > Manages Routes* page.

Note: The putting into operation of a PCAN-Ethernet Gateway DR is described in detail in chapter 3 *Putting into Operation*. Detailed information concerning the creation of routes, as well as input and selection options, can be found in chapter 5.3.2 *Add / Edit Route*.

6.2 Bidirectional Data Transmission



For bidirectional data transmission the message traffic occurring between CAN busses A and B is to be forwarded via the LAN network. For this two PCAN-Ethernet Gateways DR are needed, where for each one, a Send and Receive route must be created.

In this example Gateway 1's IP address is 192.168.1.201 and it is connected via CAN channel 1 to CAN bus A. Gateway 2's IP address is 192.168.1.202 and it is connected via CAN channel 2 to CAN bus B.

The difference here, when compared with the example in chapter 6.1, is solely that the opposite message forwarding from CAN bus B to CAN bus A must also be realized.

The Routes on Gateway 1:

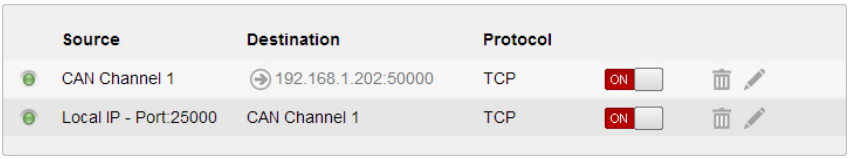
Incoming messages from Gateway 1 are to be transferred into the LAN network. For this, a Send route with the following values must be created.

Gateway 1 > Send Route A		
Route Direction	Send: CAN > IP	
Status	Activate	
CAN	Channel 1 (connected to CAN bus A)	
IP Interface	IP-Address	192.168.1.202 (address of Gateway 2)
	Port	50000
	Protocol	TCP

Gateway 1 is to accept the data packets sent via LAN network by Gateway 2, and pass the containing CAN messages through CAN channel 1 into CAN bus A. For this, a Receive route with the following values must be created.

Gateway 1 > Receive Route B		
Route Direction	Receive: IP > CAN	
Status	Activate	
IP Interface	Port	25000 (like the Send route B)
	Protocol	TCP (like the Send route B)
CAN	Channel 1 (connected to CAN bus A)	

After saving, the routes on Gateway 1 will be displayed on the *Routing > Manage Routes* page as follows.



The Routes on Gateway 2:

Gateway 2 is to accept the data packets sent via LAN network by Gateway 1, and pass the containing CAN messages through CAN

channel 2 into CAN bus B. For this, a Receive route with the following values must be created.

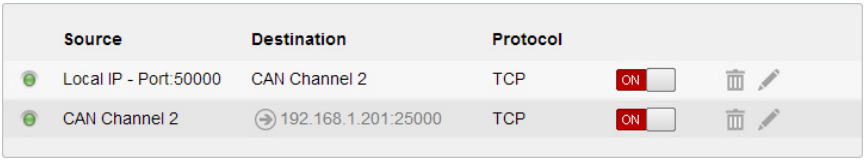
Gateway 2 > Receive Route A		
Route Direction	Receive: IP > CAN	
Status	Activate	
IP Interface	Port	50000 (like the Send route A)
	Protocol	TCP (like the Send route A)
CAN	Channel 2 (connected to CAN bus B)	

Gateway 2 should transmit incoming message traffic from CAN bus B into the LAN network. For this a Send route with the following values must be created.

Gateway 2 > Send Route B		
Route Direction	Send: CAN > IP	
Status	Activate	
CAN	Channel 2 (connected to CAN bus B)	
IP Interface	IP-Address	192.168.1.201 (address of Gateway 1)
	Port	25000
	Protocol	TCP

Transferring data between 2 PCAN-Gateways always consists of a Send and a Receive route. Note that both should use the same transfer protocol (TCP or UDP) and the same port.

After saving, the routes on Gateway 2 will be displayed on the *Routing > Manage Routes* page as follows.



A short time after all routes have been created and activated, the bidirectional connection will establish. You can interrupt the connection by deactivating or erasing one of the routes on the *Routing > Manages Routes* page.

Note: The putting into operation of a PCAN-Ethernet Gateway DR is described in detail in chapter 3 *Putting into Operation*. Detailed information concerning the creation of routes, as well as input and selection options, can be found in chapter 5.3.2 *Add* / Edit Route.

7 Technical Specifications

Connectors	
CAN	2 x Phoenix connector 4-pin*
LAN	RJ-45 socket
RS-232	Phoenix connector 4-pin*
Power	Phoenix connector 4-pin*

CAN	
Specification	ISO 11898-2; High-speed CAN 2.0A (standard format) and 2.0B (extended format)
Bit rates	5 kbit/s - 1 Mbit/s
Transceiver	NXP PCA82C251
Galvanic isolation	Isolation of the CAN channels up to 500 V against each other, against RS-232 and the power supply
Termination	none
Listen-only mode	Separately switchable for both CAN channels

LAN	
Protocol	TCP, UDP
Bit rates	10/100 Mbit/s Base-T
Standard	IEEE 802.3
Additional Features	Auto-Sensing with 10/100 Mbit/s Auto-Crossover

Power supply	
Supply voltage	8 - 30 V DC
Max. current consumption	360 mA at 8 V 240 mA at 12 V 100 mA at 30 V

* Phoenix connector, type: MSTB 2,5/4-ST BK, order no.: 1756298, www.phoenixcontact.com

Measures	
Size	22.5 x 99 x 114.5 mm (W x H x D) See also dimension drawing Appendix B on page 63
Weight	105 g

Environment	
Operating temperature	-40 - 85 °C (-40 - 185 °F)
Temperature for storage and transport	-55 - 125 °C (-67 - 257 °F)
Relative humidity	15 - 90 %, not condensing
EMC	EN 55024: 2011-09 EN 55022: 2011-12 EC directive 2004/108/EG
Ingress protection (IEC 60529)	IP20

Appendix A CE-Certificate

PCAN-Ethernet Gateway DR IPEH-004010 – EC Declaration of Conformity
PEAK-System Technik GmbH

Notes on the CE Symbol CE

The following applies to the "PCAN-Ethernet Gateway DR" product with the item number(s) IPEH-004010.

EC Directive This product fulfills the requirements of EU EMC Directive 2004/108/EG (Electromagnetic Compatibility) and is designed for the following fields of application as for the CE marking:

Electromagnetic Immunity
DIN EN 55024, publication date 2011-09
Information technology equipment – Immunity characteristics – Limits and methods of measurement (CISPR 24:2010);
German version EN 55024:2010

Electromagnetic Emission
DIN EN 55022, publication date 2011-12
Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (CISPR 22:2008, modified);
German version EN 55022:2010

Declarations of Conformity In accordance with the above mentioned EU directives, the EC declarations of conformity and the associated documentation are held at the disposal of the competent authorities at the address below:

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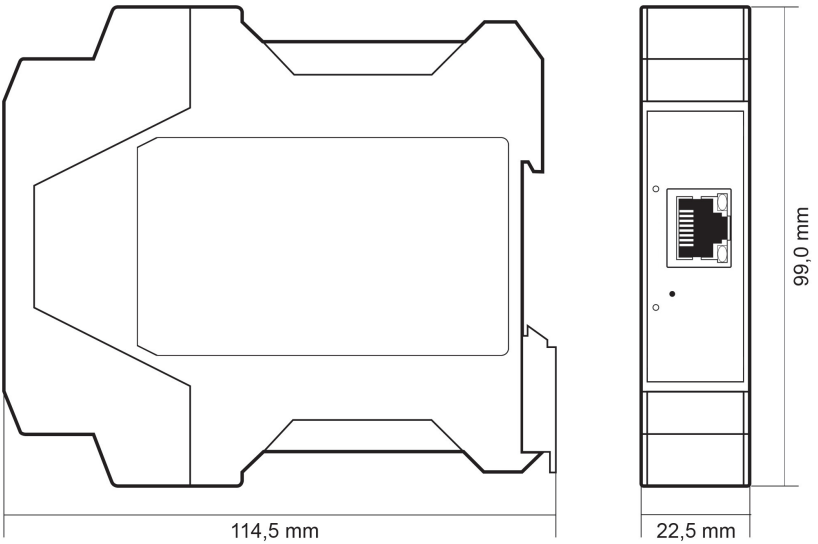
Signed this 22nd day of October 2013

Appendix B Dimension Drawing



The figure doesn't show the actual size of the product.